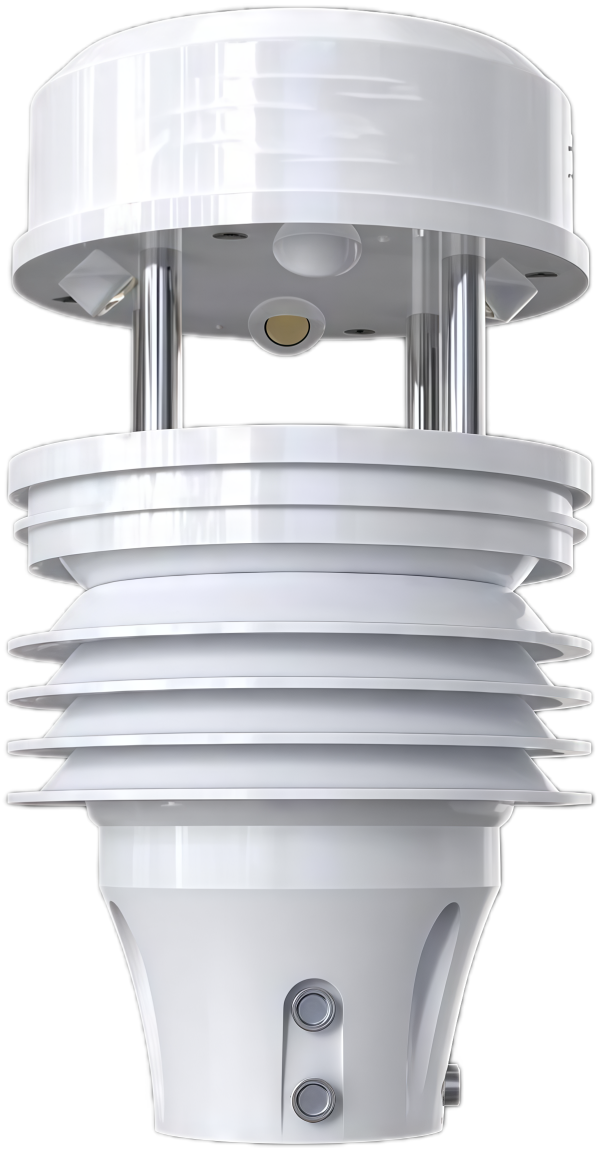
OHTS1070 Ultrasonic Integrated Weather Station

1 Product Overview



The OHTS1070 is an integrated ultrasonic meteorological monitoring device featuring a multi-parameter all-in-one structural design. It supports synchronous acquisition of meteorological elements including wind speed, wind direction, air temperature and humidity, ambient noise, particulate matter concentration (PM2.5/PM10), carbon dioxide concentration, atmospheric pressure, light intensity, optical rainfall, and total solar radiation. The device utilizes the ultrasonic time-difference method (Time-of-Flight) for wind speed and direction measurement, supporting 360° omnidirectional detection with zero starting wind speed and no mechanical wear. It features an RS485 interface supporting the standard ModBus-RTU communication protocol with a maximum communication distance of 2000m. An optional built-in electronic compass module is available for mobile platforms and installation scenarios without directional references.

The enclosure is constructed from UV-resistant ABS material with a protection rating suitable for long-term outdoor deployment. Critical sensor components utilize industrial-grade devices to ensure measurement stability across wide temperature and humidity ranges.

2 Applicable Scenarios

- Environmental monitoring stations and atmospheric quality monitoring networks
- Smart agriculture greenhouses and field environment monitoring
- Transportation vessels and vehicle-mounted mobile meteorological monitoring
- Construction site dust and noise combined monitoring
- Urban grid-based ambient air quality monitoring
- Photovoltaic power plant solar radiation and micro-environment monitoring
- Industrial plant boundary environmental parameter monitoring
- Campus and research institution meteorological observation sites
- Tunnel and mine ventilation safety monitoring
- Disaster warning and emergency meteorological support systems

3 Product Features

- **Ultrasonic Wind Speed & Direction Measurement**: Based on the ultrasonic time-difference principle, with no starting wind speed threshold, supporting a wind speed range of $0 \sim 60\mathrm{m/s}$ and wind direction range of $0^\circ \sim 359^\circ$, featuring no moving mechanical parts
- **Multi-Element Integration**: Single device integrates temperature/humidity, noise, PM2.5/PM10, CO2, atmospheric pressure, light, rainfall, and solar radiation sensors, reducing deployment complexity
- **Electronic Compass Function**: Optional built-in electronic compass eliminates installation orientation constraints; horizontal installation enables automatic wind direction reference calibration
- **Wide Voltage Power Supply**: Supports $10\mathrm{VDC} \sim 30\mathrm{VDC}$ DC power supply with typical power consumption $\leqslant 1.2\mathrm{W}$
- **Standard Communication Protocol**: RS485 interface, ModBus-RTU protocol, default baud rate $4800\mathrm{bit/s}$, supporting address configuration and parameter reading
- **Environmental Adaptability**: Operating temperature range $-40^\circ\mathrm{C} \sim +80^\circ\mathrm{C}$ (some sensors have narrower applicable ranges), UV-resistant enclosure design

4 Technical Specifications

Parameter Category	Parameter Item	Specification
Power Supply	DC Power Supply	$10\text{VDC} \sim 30\text{VDC}$
	Maximum Power Consumption	$\leqslant 1.2\text{W}$ (RS485 Output)
Wind Speed	Range	$0 \sim 60\text{m/s}$
	Accuracy	$\pm(0.2\text{m/s} \pm 0.02 \times v)$ (v = actual wind speed, $60\%\text{RH}, 25^\circ\text{C}$)
	Response Time	1s ($\tau 63$)
Wind Direction	Range	$0^\circ \sim 359^\circ$
	Accuracy	$\pm 3^\circ$ ($60\%\text{RH}, 25^\circ\text{C}$)
	Response Time	1s ($\tau 63$)
Temperature	Range	$-40^\circ\text{C} \sim +80^\circ\text{C}$
	Accuracy	$\pm 0.5^\circ\text{C}$ (25°C)
	Long-term Stability	$\leqslant 0.1^\circ\text{C/year}$
	Response Time	$\leqslant 25\text{s}$ (internal sensor airflow 1m/s)
Humidity	Range	$0\%\text{RH} \sim 99\%\text{RH}$
	Accuracy	$\pm 3\%\text{RH}$ ($60\%\text{RH}, 25^\circ\text{C}$)
	Long-term Stability	$\leqslant 1\%/\text{year}$
	Response Time	$\leqslant 8\text{s}$ (internal sensor airflow 1m/s)
Atmospheric Pressure	Range	$0 \sim 120\text{kPa}$
	Accuracy	$\pm 0.15\text{kPa}$ ($@25^\circ\text{C}, 101\text{kPa}$)
	Long-term Stability	-0.1kPa/year
	Response Time	$\leqslant 2\text{s}$
Noise	Range	$30\text{dB} \sim 120\text{dB}$
	Accuracy	$\pm 0.5\text{dB}$ (reference tone $94\text{dB}@1\text{kHz}$)
	Long-term Stability	$\leqslant 3\text{dB/year}$
	Response Time	$\leqslant 3\text{s}$
PM2.5/PM10	Range	$0 \sim 1000\mu\text{g/m}^3$
	Resolution	$1\mu\text{g/m}^3$
	Accuracy	Particle counting efficiency: $50\%@0.3\mu\text{m}, 98\%@ \geqslant 0.5\mu\text{m}$; PM2.5 accuracy: $\pm 3\%\text{FS}$ ($@100\mu\text{g/m}^3, 25^\circ\text{C}, 50\%\text{RH}$)
	Long-term Stability	$\leqslant 1\%/\text{year}$
	Response Time	$\leqslant 90\text{s}$
CO2	Range	$0 \sim 5000\text{ppm}$ (Effective range: $400 \sim 5000\text{ppm}$)
	Accuracy	$\pm(50\text{ppm} + 3\%\text{F.S.})$ (25°C)
	Long-term Stability	$\leqslant 1\%/\text{year}$
	Response Time	$\leqslant 90\text{s}$
Light Intensity	Range	$0 \sim 200000\text{Lux}$
	Accuracy	$\pm 7\%$ (25°C)
	Long-term Stability	$\leqslant 5\%/\text{year}$
	Response Time	$\leqslant 2\text{s}$
Total Solar Radiation	Range	$0 \sim 1800\text{W/m}^2$
	Accuracy	$\leqslant \pm 3\%$ ($@150\text{W/m}^2$)
	Long-term Stability	$\leqslant \pm 3\%$
	Response Time	$\leqslant 10\text{s}$

Parameter Category	Parameter Item	Specification
Optical Rainfall	Resolution	0.1mm
	Typical Accuracy	$\pm 5\%$
	Maximum Instantaneous Rainfall	24mm/min
	Rain Sensing Diameter	6cm
Communication Interface	Output Signal	RS485 (ModBus-RTU Protocol)
	Baud Rate	4800bit/s (Default, configurable)
	Data Format	8 data bits, no parity, 1 stop bit

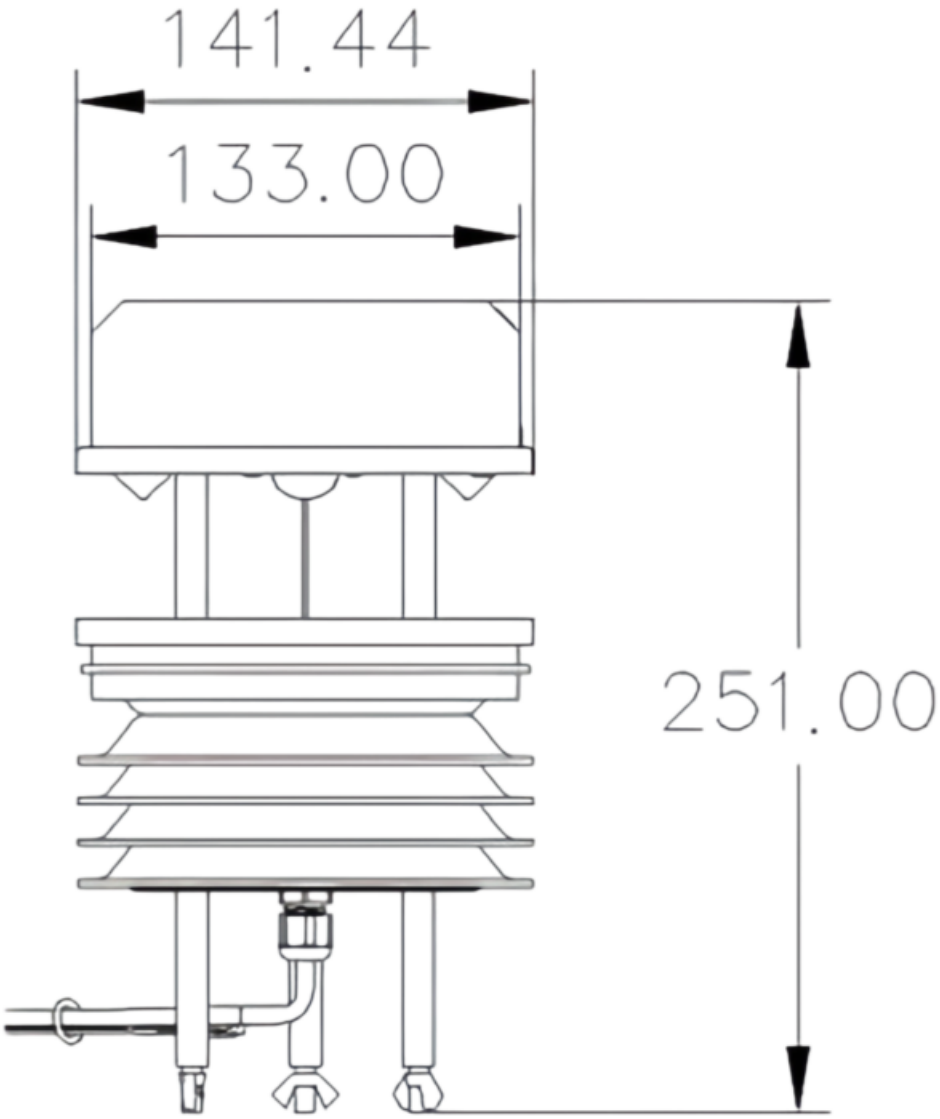
4.1 Sensor Operating Temperature Ranges

Sensor Type	Operating Temperature Range
Wind Speed & Direction Sensor	$-20^{\circ}\mathrm{C} \sim +70^{\circ}\mathrm{C}$
Wind Speed & Direction Transducer Element	$-40^{\circ}\mathrm{C} \sim +70^{\circ}\mathrm{C}$
Temperature & Humidity Sensor	$-40^{\circ}\mathrm{C} \sim +80^{\circ}\mathrm{C}$
Atmospheric Pressure Sensor	$-40^{\circ}\mathrm{C} \sim +80^{\circ}\mathrm{C}$
Noise Sensor	$-40^{\circ}\mathrm{C} \sim +80^{\circ}\mathrm{C}$
PM2.5 Sensor	$-20^{\circ}\mathrm{C} \sim +60^{\circ}\mathrm{C}$
CO2 Sensor	$-10^{\circ}\mathrm{C} \sim +60^{\circ}\mathrm{C}$
Light Intensity Sensor	$-40^{\circ}\mathrm{C} \sim +80^{\circ}\mathrm{C}$
Total Solar Radiation Sensor	$-40^{\circ}\mathrm{C} \sim +80^{\circ}\mathrm{C}$

5 Physical Specifications

Parameter	Specification
Enclosure Material	ABS (UV-resistant)
Protection Rating	Outdoor-rated
Mounting Method	Clamp mounting / Premium model mounting bracket

5.1 Mechanical Dimensions



Unit: mm

6 Installation Instructions

6.1 Pre-Installation Check

Device Inventory:

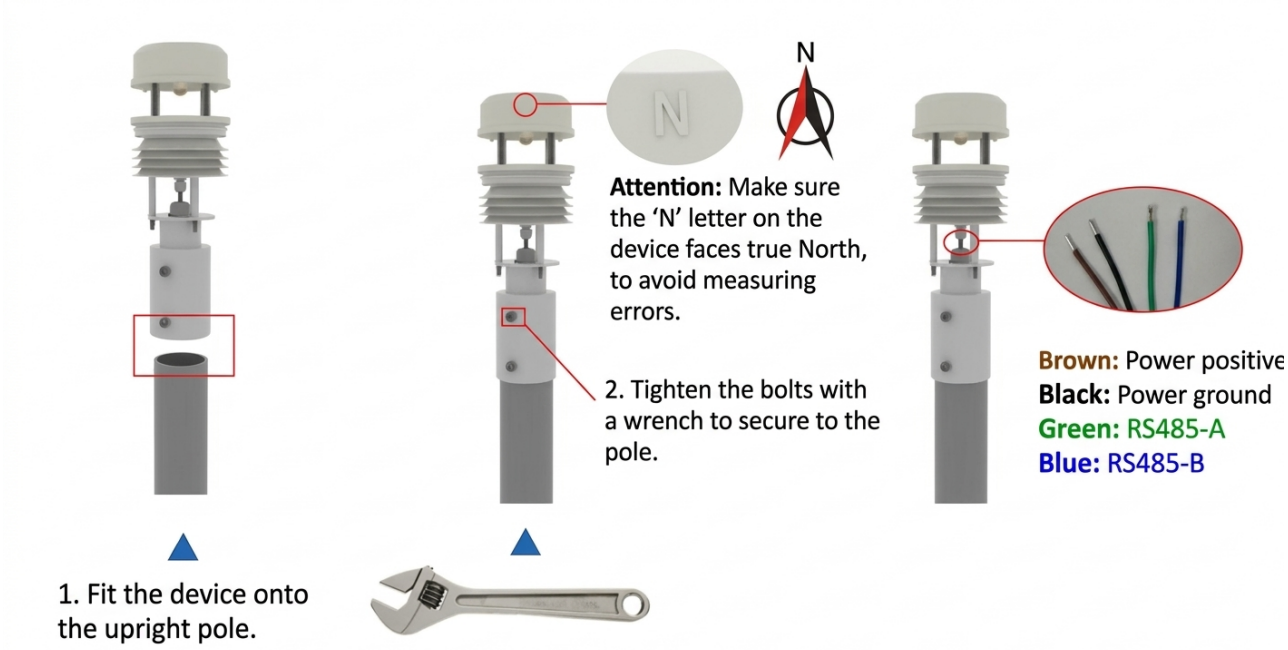
- OHTS1070 Integrated Weather Station Main Unit × 1
- Warranty Card, Certificate of Conformity
- Mounting Screw Kit (Standard model accessories)
- Hex Key Wrench (Premium model accessories)

6.2 Installation Methods

The device supports two installation methods:

1. **Standard Model Installation**: Fixed using a mounting clamp. Ensure the device is installed vertically and leveled horizontally. Models without a built-in electronic compass require the device front (sensor face) to be oriented toward true north; models with built-in electronic compass only require horizontal leveling with no directional requirements.

2. **Premium Model Installation**: Fixed using a dedicated mounting bracket and hex key wrench, suitable for mobile applications such as vessels and vehicles.



6.3 RS485 Field Wiring Instructions

When multiple RS485 devices are connected to the same bus, RS485 bus topology specifications must be followed. The recommended maximum bus length is 2000m, with 120Ω termination resistors configured as required. For specific wiring requirements, refer to the "RS485 Device Field Wiring Manual."

7 Wiring Definition

Wire Color	Function	Description
Brown	Power Positive	10VDC ~ 30VDC
Black	Power Negative	GND
Yellow (Green)	RS485-A	Differential signal positive
Blue	RS485-B	Differential signal negative

Note: RS485 signal lines A/B polarity must not be reversed; device addresses on the bus must be unique to avoid conflicts.

8 Communication Protocol and Data Conversion

8.1 Basic Communication Parameters

Parameter	Setting
Encoding	8-bit binary
Data Bits	8 bits
Parity	None
Stop Bits	1 bit
Error Check	CRC-16 (Cyclic Redundancy Check)
Baud Rate	Configurable, factory default 4800bit/s

8.2 Data Frame Format

Master Query Frame Structure:

Address Code	Function Code	Register Start Address	Register Length	CRC Low Byte	CRC High Byte
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave Response Frame Structure:

Address Code	Function Code	Valid Byte Count	Data Field 1	Data Field 2	...	Data Field N	CRC Low Byte	CRC High Byte
1 byte	1 byte	1 byte	2 bytes	2 bytes	...	2 bytes	1 byte	1 byte

8.3 Register Address Mapping

Real-Time Data Registers (Support function codes 0x03/0x04 for reading):

Register Address	PLC Address	Content	Data Conversion Description
500	40501	Wind Speed Value	Actual value × 10, Formula: $V = \frac{\text{Register Value}}{10}\ \text{m/s}$
501	40502	Beaufort Scale	Actual value (wind scale corresponding to current wind speed)
502	40503	Wind Direction (0-7 levels)	Actual value, 0 = North, increasing clockwise, East = 2
503	40504	Wind Direction (0-360°)	Actual value, 0° = North, increasing clockwise, East = 90°
504	40505	Humidity Value	Actual value × 10, Formula: $H = \frac{\text{Register Value}}{10}\ \%\text{RH}$
505	40506	Temperature Value	Actual value × 10, Formula: $T = \frac{\text{Register Value}}{10}\ ^\circ\text{C}$ (negative temperatures use two's complement)
506	40507	Noise Value	Actual value × 10, Formula: $N = \frac{\text{Register Value}}{10}\ \text{dB}$
507	40508	PM2.5 Value	Actual value, Unit: $\mu\text{g/m}^3$
508	40509	PM10 Value	Actual value, Unit: $\mu\text{g/m}^3$
509	40510	Atmospheric Pressure Value	Actual value × 10, Unit: kPa, Formula: $P = \frac{\text{Register Value}}{10}\ \text{kPa}$
510	40511	Light Value High 16-bit	High word for 200kLux range
511	40512	Light Value Low 16-bit	Low word for 200kLux range
512	40513	Light Value (hundred Lux)	Actual value, Unit: hundred Lux
513	40514	Optical Rainfall Value	Actual value × 10, Unit: mm, Formula: $R = \frac{\text{Register Value}}{10}\ \text{mm}$
515	40516	Total Solar Radiation Value	Actual value, Unit: W/m^2

Calibration Registers (Support function code 0x06 for writing):

Register Address	Supported Function Code	Operation Description
0x6001	0x06	Write 0xAA, wait 10s for device zero adjustment
0x6002	0x06	Write 0x5A for rainfall value zero adjustment

8.4 Communication Examples

Example 1: Reading Wind Speed (Address 0x01)

Query Frame: Address code 0×01, Function code 0×03, Start address 0×01 $0 \times F4$ (500), Data length 0×00 0×01

Response Frame Data: 0×00 $0 \times 7D$ (125)

Calculation:

$$V = \frac{125}{10} = 12.5 \text{ m/s}$$

Example 2: Reading Wind Direction (Address 0x01)

Query Frame: Start address 0×01 $0 \times F6$ (502)

Response Frame Data: 0×00 0×02

Result: Wind direction is East (corresponding to level 2 or 90° depending on register selection)

Example 3: Reading Temperature & Humidity (Address 0x01)

Query Frame: Start address 0×01 $0 \times F8$ (504), read 2 registers

Response Frame Example: Humidity 0×02 0×92 (658), Temperature $0 \times FF$ $0 \times 9B$ (65435, two's complement representing -101)

Calculation:

$$H = \frac{658}{10} = 65.8 \ \%\text{RH}$$

$$T = \frac{-101}{10} = -10.1 \ ^\circ\text{C}$$

Temperature Two's Complement Conversion Note:
When temperature is below 0°C, data is uploaded in 16-bit signed two's complement format. Conversion formula:

$$T = \begin{cases} \frac{\text{Register Value}}{10} & \text{if Register Value} < 32768 \\ \frac{\text{Register Value} - 65536}{10} & \text{if Register Value} \geqslant 32768 \end{cases}$$

9 Precautions

1. **Safety Warning**: This device is strictly prohibited from use as a safety device or emergency stop device, and must not be used in applications where equipment failure could cause personal injury. Technical documentation must be consulted prior to installation, operation, or maintenance.
2. **Volatile Organic Compounds**: The device utilizes a capacitive humidity sensor; avoid long-term use in environments containing volatile organic compounds (VOCs) to prevent sensor drift.
3. **Regular Maintenance**: To ensure measurement accuracy, regularly clean the lower plane of the device's measurement area, keeping it free of dust or other foreign matter accumulation.
4. **Electromagnetic Compatibility**: RS485 bus wiring should be routed away from strong electrical interference sources and avoid parallel installation with power cables.
5. **Temperature Limitations**: Strictly adhere to the operating temperature ranges of each sensor; use outside specified ranges may result in performance degradation.
6. **PM/CO2 Mutual Exclusivity**: When selecting product configurations, PM2.5/PM10 sensors and CO2 sensors cannot be configured simultaneously; select one based on application requirements.

10 Warranty and Support

Warranty Policy:

- Warranty Period: 24 months from date of purchase (valid proof of purchase required)
- Warranty Coverage: Defects in materials and workmanship under normal use and maintenance conditions, providing free repair and parts replacement
- Special Terms: Circuit components carry a 24-month warranty; PM/CO2 sensor components carry a 12-month warranty

Non-Warranty Coverage:

1. Damage caused by improper installation, use, or operation
2. Disassembly, repair, modification, or replacement of internal components by unauthorized personnel
3. Damage caused by water ingress or infiltration of other substances
4. Failures caused by accidents or natural disasters
5. Damage caused by operation outside specified product operating parameters

Technical Support:

- Lifetime repair service (paid repair service provided after warranty expiration)
- Technical documentation and configuration software support
- Communication protocol secondary development support

11 Manufacturer Information

Company Name: Shanghai OrangeHorse Electronic Technology Co., Ltd.

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12 Revision History

Version	Revision Date	Revision Content
V1.0	-	Initial release